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Sections 201 through 209

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RECORDS OF REVISION

Rev.	Date	Description	POC	OIC
0	06/29/99	Document rewritten and reformatted to support LIR 220-03-01, Facility Engineering Manual. This chapter supersedes LANL Engineering Standards Drafting Manual, Vol. 2, Rev. 7, dated 4/17/98.	Danny Nguyen, *PM-2*	Dennis McLain, *FWO-FE*
1	10/29/01	Drawing size & format defined; added grid reference; title blocks modified for new numbering system; title sheets required, fonts, line widths, text height, line types explained; location plan pinpointed; north symbol generated & location defined; partial & key plans defined; graphic scales defined; drawing scales expanded.	Richard Trout, *FWO-SEM*	Mitch S. Harris, *FWO-SEM*
2	07/15/02	Minor Change. Editorial changes throughout as indicated by revision bars. Added Section 201 subsection 5.0 Grid System.	Richard Trout, *FWO-SEM*	Kurt Beckman, *FWO-SEM*

201 DRAWINGS

1.0 DRAWING SHEET SIZES AND FORMAT

A. Produce standard construction drawings and individually controlled drawings on a "D" size sheet.

B. Produce Engineering Studies, Conceptual Design Reports, and Design Criteria drawings on a "B" size sheet whenever possible.

C. Use a consistent size of drawing sheet throughout the Drawing Set.

D. Provide a continuous line sheet border, as illustrated below, that is 0.75 mm thick (1/16 inch).

E. Standard drawing sheet sizes, borders, and formats are shown below. The overall dimensions are the sheet cut size.

F. *Guidance: An "A" size sheet may be used for sketches for Engineering Change Notices (ECN), etc. The title block should contain the same information as in Section 202, Figure 202-4.*

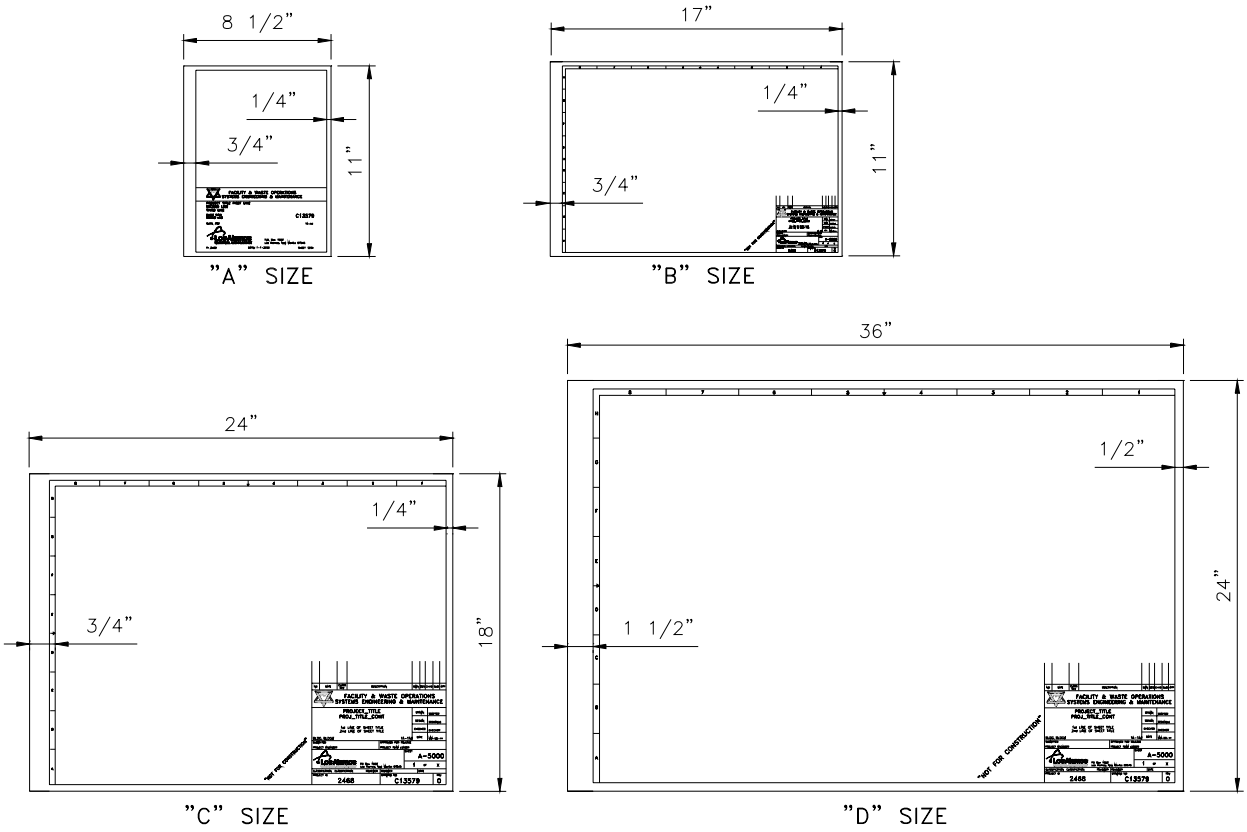
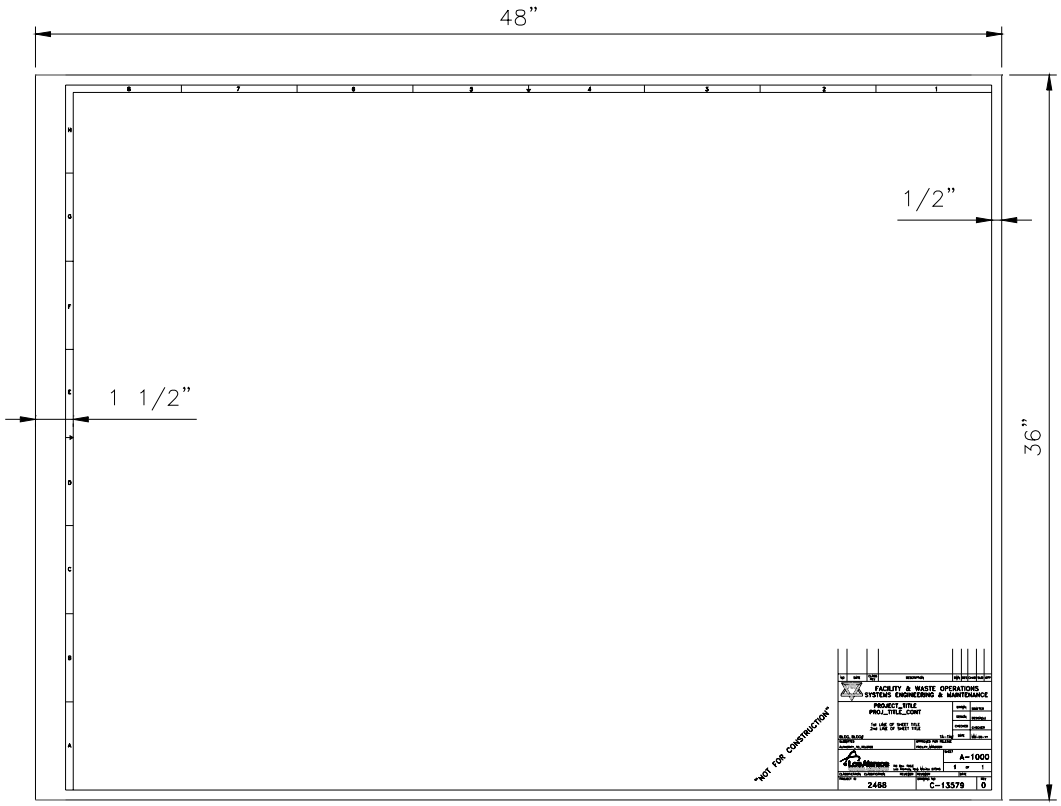


Figure 201-1



"E" SIZE

Figure 201-2

G. "C" and "E" size sheets may be used for special projects not related to 1.0 A and B of this section. LANL project manager shall give guidance for determining sheet usage. (No construction drawings on "E" sized sheets.)

2.0 FINAL DRAWING SUBMITTAL

A. Submit all drawings (initial issue and revisions) to FWO-SEM, CM Team for record keeping. Submit paper prints and electronic files as follows:

1. **Paper prints:** Full size, with all required signatures/initials signed off. Use black line on a minimum 0.003 inch paper thickness. Do not use stick-on, appliqués, zip-a-tone, etc. on final drawing sheets.
2. **Electronic files:** Refer to Section 215 for requirements.

3.0 "NOT FOR CONSTRUCTION" NOTATION

The note "NOT FOR CONSTRUCTION" is to be marked on all in-progress construction drawing sheets in a Construction Drawing Set. Do not remove this notation until the drawings are approved for final release. See Symbol block in Appendix B, General.

Appearance	Font	Location
Letter size 1/4 inch	Romand	Left of the title block at a 45-degree angle, read from left to right

4.0 SEALED DRAWINGS

A. Comply with the LANL Engineering Manual (LEM) for the requirements of sealing construction documents.

B. The preferred (if required) location of the Engineer's Stamp (seal) is to the "immediate left" of the title block just above the sheet border.

5.0 GRID SYSTEM

A. Grid system is used to indicate structural columns, load-bearing walls, shear walls and other structural elements on the drawings.

B. Grid lines are used as a basis for dimensioning.

C. Vertical grid lines shall have designators at the top of the grid numbers from left to right.

D. Horizontal grid lines shall have designators at the right side of the grid alphabetized from bottom to top.

E. To eliminate confusion with the numerals 0 (zero) and 1 (one), do not use letters "O" or "I."

F. In some cases, column designators may be shown at both ends of the grid line to facilitate references.

G. Where additional intermediate structural support elements occur between grid lines, a fractional designation is used (e.g., a column occurring at mid-point between grid lines 2 and 3 would be designated as 2.5, a column occurring between grid lines B and C would be represented as B.5.

H. Show column lines using 0.35 mm (0.015 inches) pen width, pen color 7 (white) to form centerlines with 1/2 inch circle diameters on layer name S-Grid.

I. All disciplines shall use this convention for column lines.

J. For existing conditions match existing column designators.

Basis: National CAD Standard.

202 DRAWING TITLE BLOCKS

1.0 GENERAL

A. Maintain consistency and accuracy in title block format and content throughout the Drawing Set.

B. The extent of the drawing field and an example of the title block are shown below. *This allows for the consistent placement of notes, general notes, security classification stamps, and key plans. The preferred extent of the drawing field is illustrated, for clarity purposes only, with the dashed line.*

1. Do not graphically show this border on the drawing.

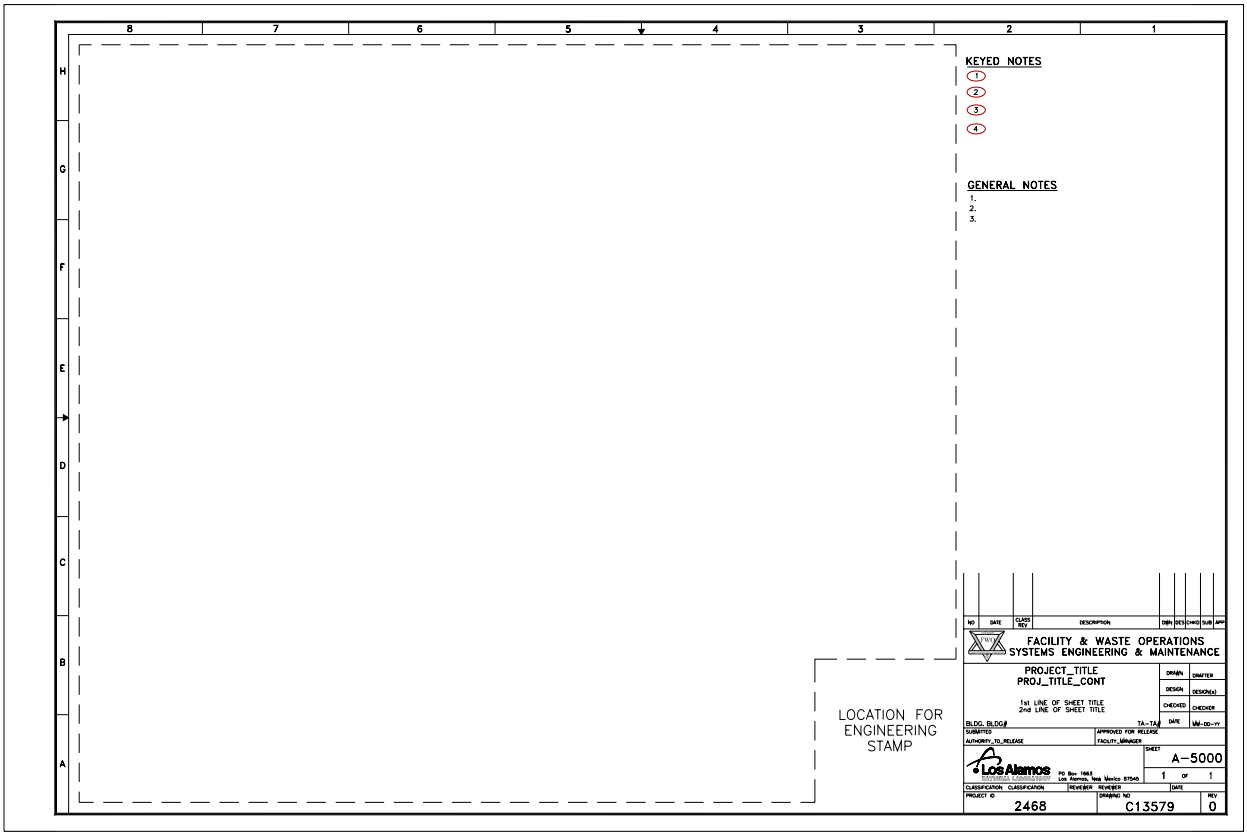


Figure 202-1

2.0 TITLE BLOCK FOR CONSTRUCTION DRAWINGS

A. The standard Title Block for construction drawings is shown in Figure 202-2. See Table 202-1 for legend and description of the required Title Block contents.

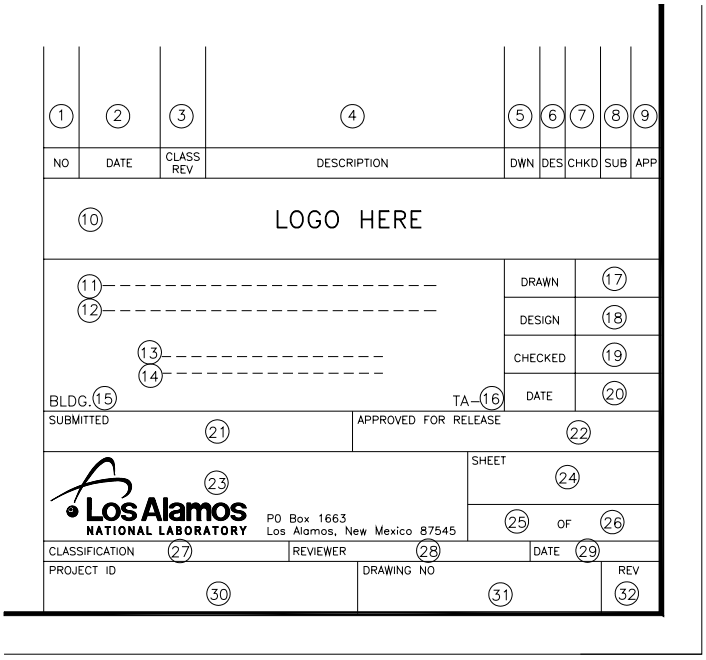


Figure 202-2

B. Figure 202-3 is an example of the Title Block for construction drawings.

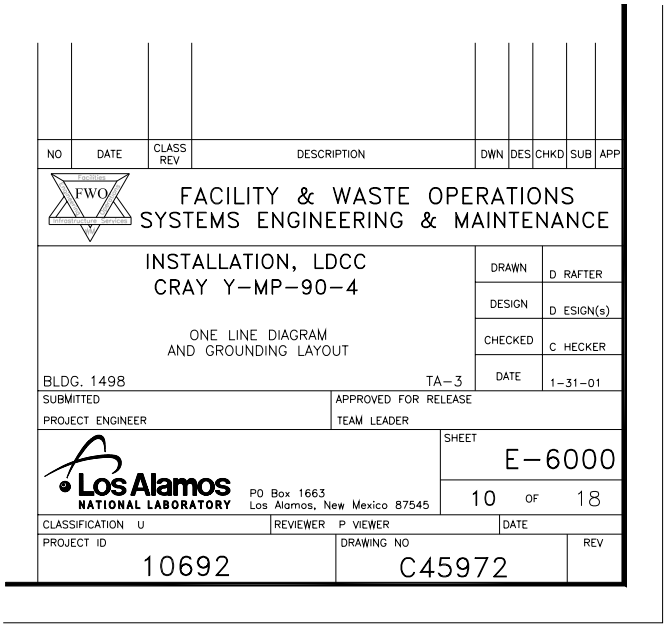


Figure 202-3

C. Standard LANL Title Blocks have been created on the World Wide Web site listed in Appendix H (http://www.lanl.gov/orgs/f/f6/pubf6stds/drftman/drft_symbols.html).

TABLE 202-1
Construction Drawing Title Block Contents

Item	Description	Character/ Size Font	Notes	Data Definition
1	Revision Number	3/32” romans		Number of revision made to the drawing.
2	Date of Revision	3/32” romans		Date the revision was made to the drawings.
3	Classification	3/32” romans	1, 4	The LANL ADC familiar with the project or area of construction will classify the revision and place his or her signature to the right of the classification in the revisions block (Item #4) with an explanation for the reclassification.
4	Revision Description	3/32” romans		A description of the changes made to the drawing, P.I. number, A/B date, etc.
5	Drawn	3/32” romans	1	Initials and/or last name of the designer/drafter.
6	Design	3/32” romans	1	Initials and/or last name of the designer/engineer.
7	Checked	3/32” romans	1	Initials and/or last name of the checker.
8	Submitted	3/32” romans	3, 5	Initials of the person in the design agency with the authority to release the drawings
9	Approved for Release	3/32” romans	3, 5	Initials of the LANL Project Leader or Facility Manager with final approval for release.
10	Drawing Originating Organization			The logo/name of the organization or firm doing the design.
11	Project Title	3/16” romans	2	A project title will be filled in for: new facility construction, new addition to an existing facility, the installation of a new system in an existing facility, or Standards Manual Drawing. No title descriptions are required, for modifications or upgrades to existing facilities or systems.
12	Project Title Line 2	3/16” romand	2	
13	Sheet Title	1/8” romand	2	A descriptive title of the information contained on the drawing sheet. Typically, the type of drawing (e.g., Process and Instrumentation Diagram)
14	Sheet Title Line 2	1/8” romand	2	Space for continuation of the Sheet Title. Typically, the detail information (e.g., Compressed Air system)
15	Building Number	1/8” romans		The unique identifying number for a building or structure within a designated technical area.
16	Technical Area	1/8” romans		The geographical area designation assigned to LANL properties.

Continued on next page

TABLE 202-1
Construction Drawing Title Block Contents (con't)

Item	Description	Character/ Size Font	Notes	Data Definition
17	Drawn	3/32" romans	1	First initial and last name of the drafter/designer. (Not required for issuance after revision 0.)
18	Design	3/32" romans	1	First initial and last name of the designer/engineer. (Not required for issuance after revision 0.)
19	Checked	3/32" romans	1	First initial and last name of the person who checked the drawings, but not the same person who designed or produced the drawing. (Not required for issuance after revision 0.)
20	Date	3/32" romans	1	Date the final drawing set is issued. Date all sheets the same.
21	Submitted	3/32" romans	3, 5	Typed name and signature of the person at the design agency with the authority to release the documents.
22	Approved for Release	3/32" romans	3, 5	Typed name and signature of the LANL Project Team Leader or Facility Manager responsible for the project with the final approval for release.
23	Responsible Organization			Logo/name of the organization for whom the drawing is produced (LANL).
24	Discipline Sheet Number	3/16" for more than three characters romand		Alphanumeric characters sequentially numbered, by discipline through the project drawing set. Also see Section 211.
25	Project Sheet Number	3/16" Text height and 0.85 text width romand		A sequential number assigned to each drawing sheet in a project drawing set.
26	Number of sheets in a project drawing set	3/16" Text height and 0.85 text width romand		Total number of drawings in the project drawing set.

Continued on next page

TABLE 202-1
Construction Drawing Title Block Contents (con't)

Item	Description	Character/ Size Font	Notes	Data Definition
27	Classification	3/32" romans	1, 4	The security classification of the drawing set uses a designation of: **"U"** for Unclassified; **"OUO"** for Official Use Only; **"C"** for Confidential; **"UCNI"** for Unclassified Controlled Nuclear Information; and, **"S"** for Secret. The LANL Authorized Derivative Classifier (ADC) can provide the classification requirements. For a drawing set that contains security information, each drawing shall be stamped with the classification with text of not less than 1/8". Example: Appendix B symbol G39 UCNI stamp.
28	Classifier/ Reviewer	3/32" romans	1, 4	The signature or initial and name of the person authorized to classify drawings.
29	Classification Date	3/32" romans	4	Date of classification signature.
30	Project Identification Number	1/4" romand		A unique number assigned to a task by the LANL Computerized Maintenance Management System (CMMS). This number is used for projects that generate paper documents and record drawings to be placed in LANL FWO-SEM Records Center.

Continued on next page

TABLE 202-1
Construction Drawing Title Block Contents (con't)

Item	Description	Character/ Size Font	Notes	Data Definition
31	Drawing Number **"C"**	1/4" romand		A unique number assigned to the drawing set by the FWO-SEM CM Team Office. It is an alphanumeric number with no spaces, dashes, or slashes; preceded by the capital letter "C." Used for record drawings associated with new facility and additions to existing facility construction.
	Drawing Number **"PL"**	1/4" romand		A unique number assigned to the plate(s) (PL) set by the FWO-SEM CM Team Office. It is an alphanumeric number with no spaces, dashes, or slashes; preceded by the capital letters "PL."
	Drawing Number **"SK"**	1/4" romand		A unique number assigned to the sketch (SK) by the FWO-SEM CM Team Office. It is an alphanumeric number with no spaces, dashes, or slashes; preceded by the capital letters "SK."
	Drawing Number **"ST"**	1/4" romand		A unique number assigned to the standard drawing (ST) by the FWO-SEM CM Team Office. It is an alphanumeric number with no spaces, dashes, or slashes; preceded by the capital letters "ST."
32	Revision Number	1/4" romand		Number of revisions made to the drawing.

Notes:

1. Enter appropriate names and dates electronically. When issuing drawings for design review, initials or signatures are required for the checked, submitted, and classification blocks. For the final issue, initials or signatures are required above or alongside all printed names.
2. Do not underline titles or subtitles.
3. The title block contents (8, 9, 21 & 22) are an example of required approvals. The number and headings of approval signatures/initials shall be determined by the LANL Project Leader.
4. a. This section of the title block must be filled in when the record document package is signed off for approval.
   b. Follow LANL's S-7 Group requirements for review/signature.
   c. *Guidance: Use an Authorized Derivative Classifier (ADC) associated and/or familiar with the project. The ADC should be contacted and informed about the project during the early stages of design development.*

Basis: DOE Order 475.1-1, Identifying Classified Information, which is part of the WSS, states in Chapter VI that:

"Review Requirements. Anyone who originates a document or material in a subject area that may be classified shall submit the document or material to the appropriate official for a classification review and determination prior to dissemination.

a.) Routine Document or Material. An employee with an active access authorization who originates a document or material in a subject area that may be classified shall submit the document or material to a Derivative Classifier for classification review prior to dissemination. An employee who had an active access authorization in the past shall submit such a document or material to the local Classification Officer for classification review prior to dissemination. The local Classification Officer may delegate this review responsibility to specified Derivative Classifiers."

In addition, drawings placed on MOADS by FWO-SEM CM must be unclassified.

5. *Guidance: additional "submittal" or "approved" blocks may be added to suit project sign-off requirements.*

3.0 TITLE BLOCK AND DRAWING FORMATS FOR ENGINEERING STUDIES (ES), DESIGN CRITERIA (DC), AND CONCEPTUAL DESIGN REPORTS (CDR)

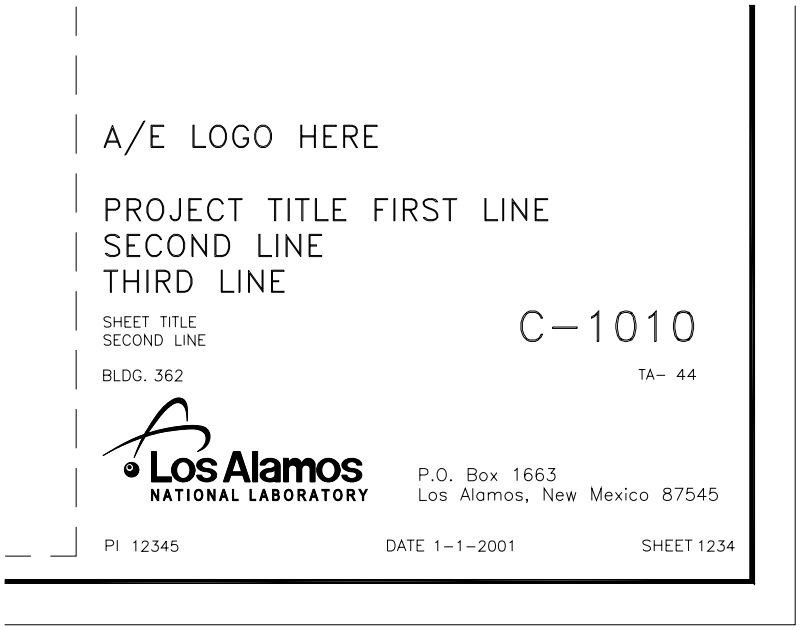
A. The drawings produced for Engineering Studies (ES), Design Criteria (DC) and Conceptual Design Reports (CDR) are not intended for use as construction documents; therefore, stamps and signatures are not required. The FWO-SEM CM Team will enter title block information in its master database when record copy is received.

B. Provide accurate and consistent information in the title block throughout the drawing set.

C. Produce Engineering Studies, Design Criteria and Conceptual Design Report drawings on "D" size sheets and submit on 11" X 17" drawing (B size) sheets for binding or folding for insertion into the 8-1/2" X 11" (A size) report format.

D. Convey the project information in the simple format illustrated below. For a description of the required Title Block Contents see Table 202-2.

E. The following is an example of the Title Block format for the Studies and Reports (for a description of contents see Table 202-2).



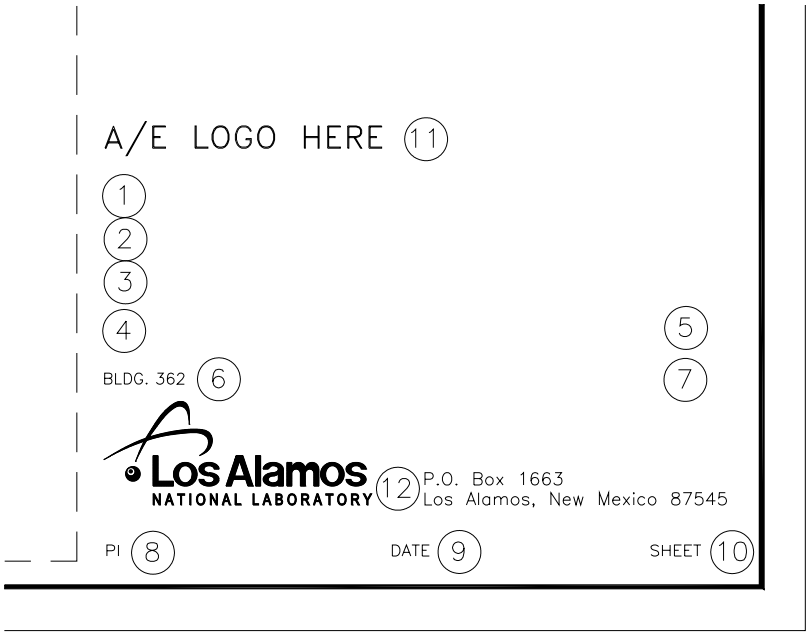


Figure 202-4

TABLE 202-2
Engineering Study, Design Criteria and Conceptual Design Report
Title Block Contents

Item	Description	Character/ Size Font	Notes	Data Definition
1	Project Title	1/8” romand	1	A descriptive name of the project. Project Title and Title Sheet required for new facility construction. Not required for modifications to existing facilities.
2	Project Title Line 2	1/8” romand	1	Space for continuation of the Project Title.
3	Project Title Line 3	1/8” romand	1	Space for continuation of the Project Title.
4	Sheet Title	3/32” romand	1	A descriptive title of the information contained on the drawing sheet. There are two lines for the sheet title. First line is generally the type of drawing (e.g., Process and Instrumentation Diagram), second line generally the specific information (e.g., Compressed Air System).
5	Discipline Sheet Number	3/16” romand		Alphanumeric character, sequentially numbered, by discipline through the project drawing set.
6	Building Number	1/16” romans		The unique identifying number for a building or structure within a designated technical area.
7	Technical Area	1/16” romans		The geographical area designated assigned to LANL properties.
8	Project Identification Number	1/16” romans		A unique number assigned to a task by the CMMS.
9	Date	1/16” romans		The date the drawing set is issued for review or as final. Use the same date for all sheets in the drawing set.
10	Sheet Number	1/16” romans		A unique plate # (PL#) number assigned by FWO-SEM CM Team Office.
11	Drawing Originating Organization	no requirement		The logo/name of the organization or firm doing the design.
12	Project Sheet Number/ number of sheets in a project drawing set	1/8”		A sequenced number assigned to each drawing sheet in a project drawing set, and the total number of drawings in a drawing set.

Note: Do not underline titles or subtitles.

203 TITLE SHEET

1.0 GENERAL REQUIREMENTS

A. Provide a Title Sheet for drawings regardless of the number of drawing sheets in the drawing set.

B. *Guidance: Title sheets are not required but recommended for Engineering Studies, Design Criteria, and Conceptual Design Reports.*

2.0 EXAMPLE OF TITLE SHEET

A. The following graphic is an example of the Title Sheet for new projects (see Table 203-1 for content description). This Title Sheet (Appendix H) is found on the worldwide web site address: (http://www.lanl.gov/orgs/f/f6/pubf6stds/drftman/drft_symbols.html)

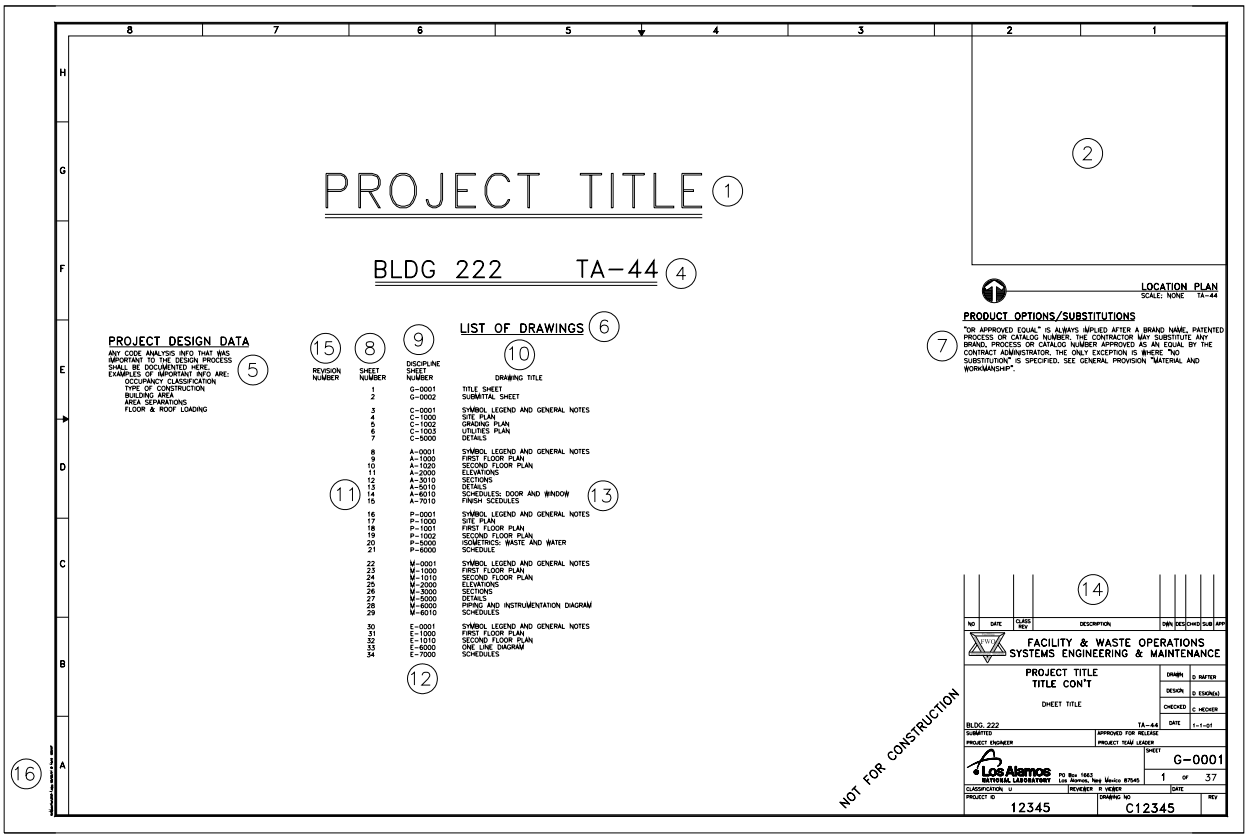


Figure 203-1

TABLE 203-1
Title Sheet Contents

Item	Description	Character/ Size Font	Data Definition
1	Project Title	1 inch, Romand, double underline 0.50 mm line width, color 1, continuous	The descriptive name of the project. Project title and title sheet required for new facility construction. Not required for modifications to existing facilities.
2	Location Plan	No scale	A plan that illustrates the location of the project - see Figure 203-1.
3	Building Number	1/2 inch, Romand, double underline 0.50 mm line width, color 1, continuous	The unique identifying number for a building or structure within a designated technical area.
4	Technical Area	1/2 inch, Romand, double underline	The geographical area designation assigned to LANL properties.
5	Project Design Data	1/8 inch Romans	This information is required - usually pertinent code analysis information is inserted here. Reference the code used and date of the code. (See LANL Engineering Manual, Chapter 4 - Architectural, Project Design Data.)
6	List of Drawings	1/4 inch Romand, single underline 0.50 mm line width, color 1, continuous	The header for the Drawing List.
7	Product Options and Substitution Statement	1/8 inch, Romans	A brief LANL procurement policy statement - see subpart 4.0 herein.
8	Sheet Number	1/8 inch Romand	The column header for the list of drawings sheet numbers.
9	Discipline Sheet Number	1/8 inch Romand	The column header for the list of drawings discipline sheet numbers.
10	Drawing Title/Header	1/8 inch Romand	List of the drawing sheet titles - show exactly as they appear in the title blocks of the drawing sheets.
11	Sheet Number	1/8 inch Romans	The number shown in the title block of each drawing sheet.
12	Discipline Sheet Number	1/8 inch Romans	The number shown in the title block of each discipline drawing sheet.
13	Drawing Titles	1/8 inch Romans	List of drawing sheet titles - show exactly as they appear in the title blocks of the drawing sheets.
14	Title Block	-	See Section 202.
15	Revision Column	1/8 inch Romans	The column header for the list of revisions that affect the drawing sheets.
16	Date Stamp	3/32” Romans	This stamp will assist in drawing file management, locating projects and data.

Note: All entries on the title sheet will be on layer: text, color: white, 0.35 mm pen width (0.015”).

3.0 LOCATION PLAN

A Location Plan is an area map that graphically illustrates the general location, by technical area, where the construction is planned.

A. All drawing sets are required to have a Location Plan.

B. Locate this plan on the Title Sheet in the upper right hand corner of the sheet (Fig. 203-1), as illustrated in Figure 203-2. The plan and all text shall not cover more than a 7.5" x 7.5" square.

C. Show enough of the surrounding areas (streets, buildings, structures, etc.) to clearly identify the project location.

D. Orient the Location Plan on the drawing sheet so that the north arrow points to the top of the sheet, as illustrated.

E. An electronic or hard copy Location Plan can be obtained from the FWO-SEM CM Team or the Support Services Subcontractor "As-Built" program for various Technical Areas within the LANL boundary.

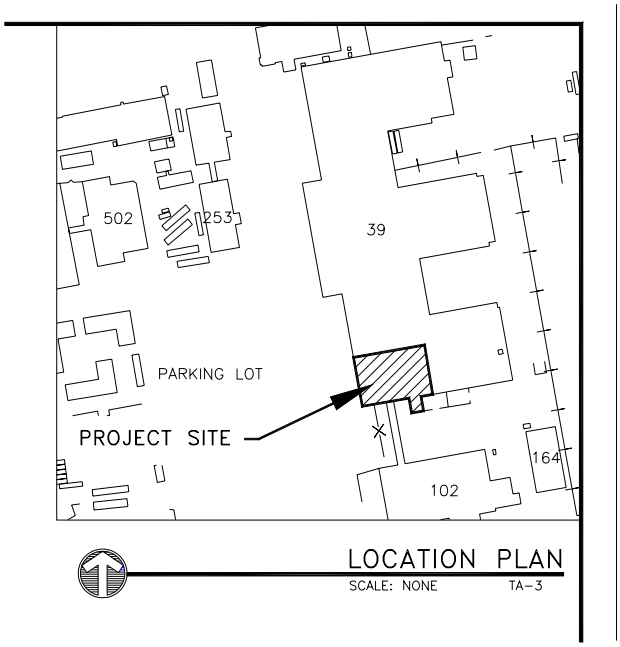


Figure 203-2

F. The borderline around the location plan shall be 0.50 mm line width.

G. Text requirements:

Project Site	3/16 inch romand
Location Plan	1/4 inch romand
TA	1/8 inch romans

All on Color: 7, Layer: Text

4.0 PRODUCT OPTIONS AND SUBSTITUTIONS

Note: This block is only required on projects without a specification package.

1. Enter the substitution statement exactly as stated in Section 01630 of the LANL Construction Specifications, layer: text.
2. The following is the wording from Section 01630 as of July 2001:

PRODUCT OPTIONS AND SUBSTITUTIONS
(3/16" text height, romand)

"Or approved equal" is always implied after a brand name, patented process or catalog number. The contractor may substitute any brand or process approved as an equal by specifying Architect/Engineer. The only exception is where "no substitution" is specified. See General Provision "Material and Workmanship."
(1/8" text height, romans)

3. For location of this block see Section 203, subpart 2.0, Example of Title Sheet.

204 PLAN ORIENTATION

1.0 GENERAL

A. Except for Civil Plan and Section (profile) drawings, comply with the following for plan orientation on drawing sheets. *Guidance: Whenever possible orient the site plan in the same manner as the floor plan.*

1. Place the principal plans on the drawing sheet with the building lines parallel to the sheet borders.
2. Orient all principal plans in the drawing set identically for continuity and clarity.
3. Orient the plans on the drawing sheet so that the north arrow is pointing in the direction of either the upper left or upper right quadrants of the sheet.

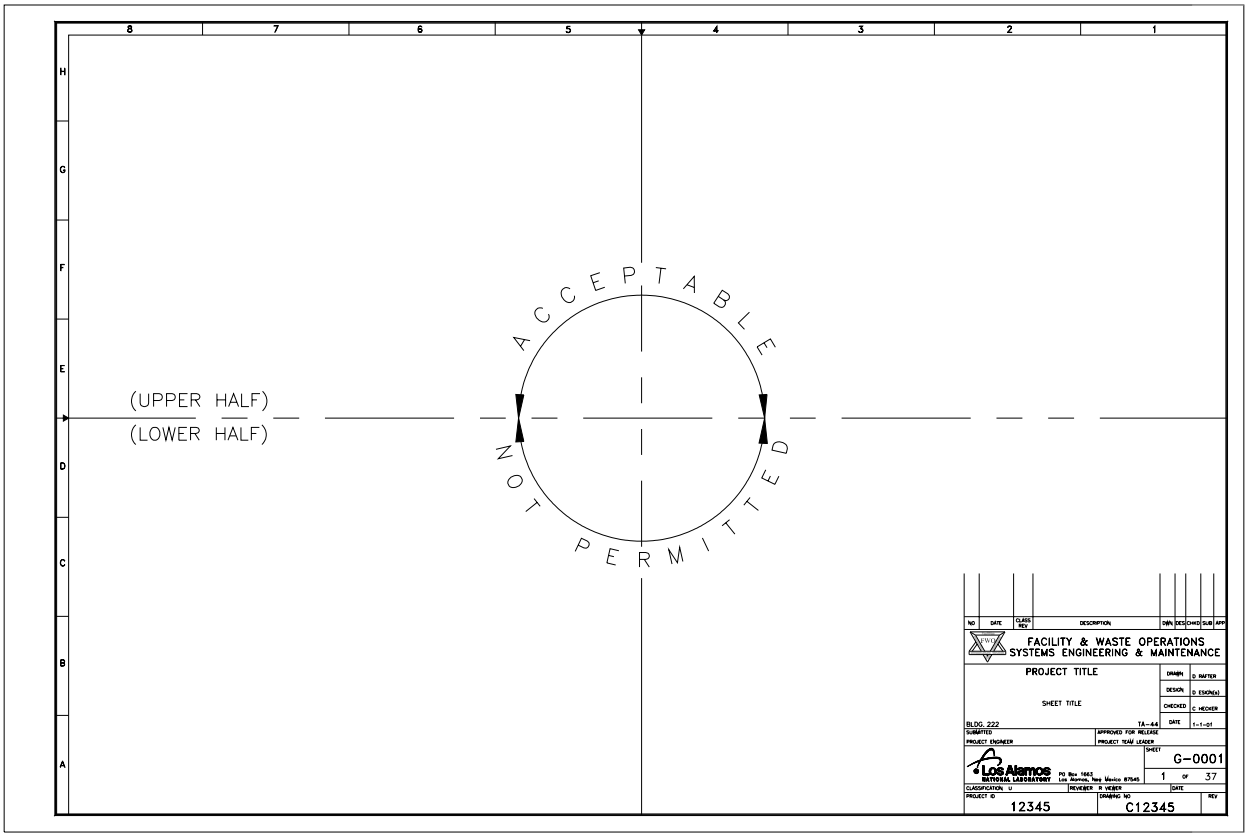


Figure 204-1

205 NORTH ARROW SYMBOL

1.0 EXAMPLES OF NORTH ARROW

The graphic below is the required North Arrow ("True North") and is located as a block (G01), Appendix B, General Graphic Symbols.

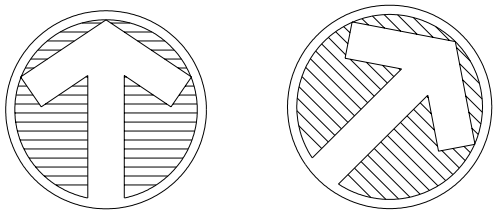


Figure 205-1

2.0 GENERAL REQUIREMENTS FOR NORTH ARROW

A. Place of the North Arrow symbol is at the left end of the horizontal line under the title.

B. For "C," "D," and "E" size sheets make the circle 5/8 inches. For "A" and "B" size sheets make the circle 5/16 inches.

206 PARTIAL PLANS

1.0 KEY PLANS

A. Use a small scale "key plan" for each drawing sheet on which a partial plan appears.

B. Clearly indicate on the "key plan" where the partial plan occurs in the overall building layout.

C. Orient partial plans and key plans identically.

D. Locate the “key plan” in the upper right hand corner of the sheet and occupy a space no larger than a 5” x 5” square including all text.

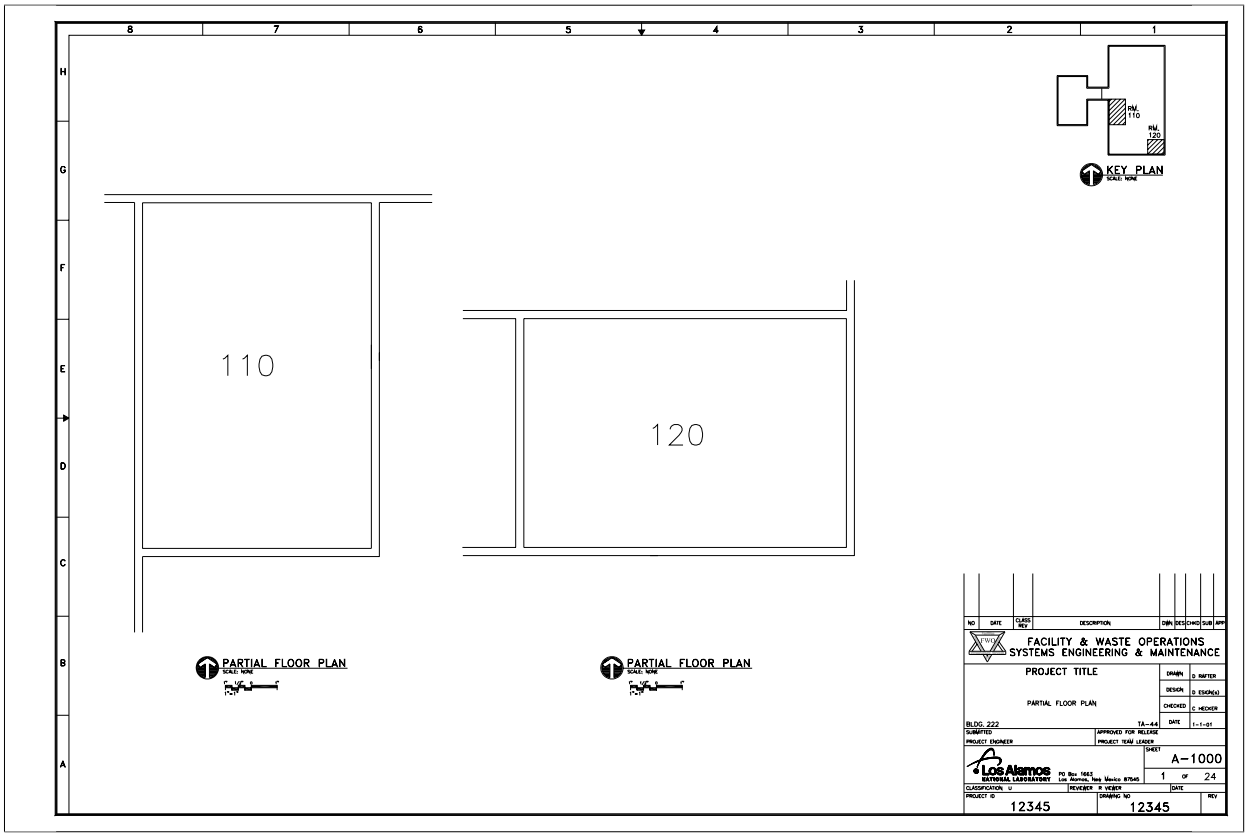


Figure 206-1

2.0 MATCH LINES

A. When a plan is too large for one drawing sheet, divide the plan into logical sections.

B. Provide a match line that is 0.80 mm (0.031") thick, phantom line type.

C. Use a 1/4" text height, romand font, 0.50 mm line width to clearly indicate where the plan continues on another sheet, as illustrated below.

D. Use a key plan (see Figure 206-1).

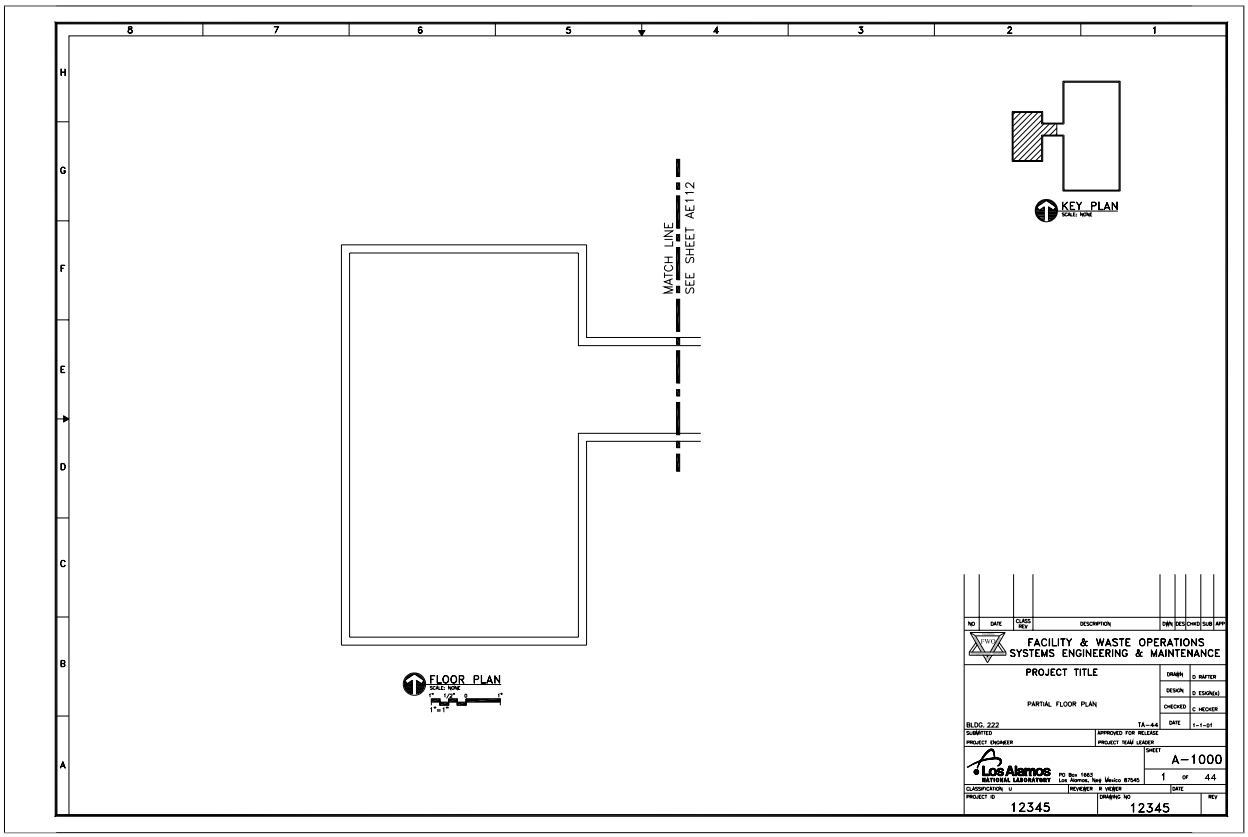


Figure 206-2

207 SUBMITTAL SHEET

1.0 CRITERIA AND GUIDELINES FOR SUBMITTAL SHEET

It is strongly recommended that LANL Construction Specifications Section 01300, Submittals, be used. In all contract packages alternatively include a submittal sheet (General Information "G" Sheet) in the drawing set when submittals are required but when a specification package is not included with the construction documents. Use the following guidelines in producing the submittal sheet and stating the submittal requirements:

A. Produce a Submittal Schedule and Definition of Submittal Types on the "G" sheet (See Figure 207-1).

B. Do not place submittal lists on any of the discipline sheets.

2.0 NUMBERING THE REQUIRED SUBMITTALS

A. Assign each submittal an alphanumeric designation using no more than 3 characters. This alphanumeric designation is the "SUB NO." in the submittal schedule illustrated on the following page.

B. An alphanumeric designation represents the discipline requiring the submittal. Assign an alpha character representing the discipline using Section 210, Drawing Set Organization, as a guideline.

C. Assign a sequential number designation to the submittal by discipline.

3.0 SUBMITTAL SCHEDULE

The schedule is a General Symbols block (G44), found in Appendix B of this manual and LANL Construction Specifications, Section 01300.

Example of Submittal Sheet

SUBMITTAL SCHEDULE

P = REQUIRED WITH PROPOSAL; SUBMIT ONE COPY OF SUBMITTALS INDICATED TO THE ARCHITECT–ENGINEER IN ACCORDANCE WITH THE SUBMITTAL SCHEDULE.

A = REQUIRED AFTER RECEIPT OF ORDER; SUBMIT SIX COPIES OF SUBMITTALS INDICATED TO THE ARCHITECT–ENGINEER IN ACCORDANCE WITH THE SUBMITTAL SCHEDULE.

GENERAL: MARK SUBMITTALS WITH SUBMITTAL NUMBER AND TYPES (HIGHLIGHTED) TO SHOW MODEL NUMBERS, CAPACITIES, OPTIONAL FEATURES, ETC.

SUB NO.	DESCRIPTION	DRAWING NO. ITEM NO.	SUBMITTAL TYPES															REMARKS
			CONSTRUCTION											CLOSEOUT				
			CA	CD	CT	II	ML	PD	SC	SD	TR	WD		OM	RD	SP	WA	
			CALCULATIONS	CATALOG DATA	CERTIFICATIONS	INSTALLATION INSTRUCTIONS	MATERIALS/PARTS LIST/ DESIGN MIXES	PERFORMANCE DATA/CURVES	SAMPLES/COLORS	SHOP DRAWINGS	TEST REPORTS	WIRING DIAGRAMS		OPERATION AND MAINTENANCE DATA	PROJECT RECORD DOCUMENTS	SPARE PARTS AND MAINTENENCE MATERIALS	WARRANTIES	SUBMIT CONSTRUCTION SUBMITTALS WITHIN 30 DAYS AFTER START OF CONSTRUCTION. SUBMIT CLOSEOUT SUBMITTALS WITHIN 30 DAYS AFTER FINAL INSPECTION.
G1	CONSTRUCTION DWG'S.	ALL SHEETS													A			
C1	SUMP PIT	C05001				P												
A1	OVERHEAD	A–7007				P												
M1	PUMP	M–7011		A				A										
E1	ALARMS	E–7009				P												

DEFINITIONS OF SUBMITTAL TYPES

CA. CALCULATIONS

THE METHODS AND RESULTS OF CALCULATIONS IN DOCUMENTED FORM WHERE SPECIFIED.

CD. CATALOG DATA

STANDARD PRINTED INFORMATION ON MATERIALS, PRODUCTS, AND SYSTEMS, WHICH SHOWS PERFORMANCE CHARACTERISTICS, DIMENSIONS, MATERIAL OF FABRICATION, AND OTHER CHARACTERISTICS NECESSARY TO ASSURE CONFORMITY WITH THE DESIGN REQUIREMENTS. WHERE OTHER ITEMS OR INFORMATION NOT RELATED TO THE WORK OF THIS PROJECT ARE INCLUDED IN THE LITERATURE SUBMITTED, THE ITEM(S) AND/OR INFORMATION APPLICABLE TO THIS PROJECT SHALL BE CLEARLY MARKED.

CT. CERTIFICATIONS

A WRITTEN STATEMENT, SIGNED BY A QUALIFIED PARTY, ATTESTING THAT ITEMS OR SERVICES ARE IN ACCORDANCE WITH SPECIFIED REQUIREMENTS. TYPICALLY, THIS WRITTEN STATEMENT IS ACCOMPANIED BY ADDITIONAL INFORMATION TO SUBSTANTIATE THE STATEMENT.

II. INSTALLATION INSTRUCTIONS

MANUFACTURER'S INSTRUCTIONS, STEP–BY–STEP IF NECESSARY, SHOWING THE FIELD INSTALLATION OF PARTS, COMPONENTS, EQUIPMENT AND OTHER SIMILAR ITEMS.

ML. MATERIAL LIST/PARTS LIST/DESIGN MIXES

A LIST OF SYSTEM COMPONENTS OR MATERIAL COMPONENTS.

PD. PERFORMANCE CURVES/DATA

PERFORMANCE CURVES AND/OR DATA FOR THE SELECTED EQUIPMENT TO SHOW COMPLIANCE WITH CONTRACT DOCUMENTS.

SC. SAMPLES/COLORS

SAMPLES, INCLUDING COLORS OF PROPOSED MATERIALS.

SD. SHOP DRAWINGS

DRAWINGS NECESSARY TO SHOW FABRICATION DETAILS TO ENSURE COMPLIANCE WITH CONTRACT DOCUMENTS.

TR. TEST REPORTS

RESULTS OF SPECIFIED TEST REQUIREMENTS.

WD. WIRING DIAGRAMS

DRAWINGS SHOWING THE POINT–TO–POINT WIRING OF A PIECE OF EQUIPMENT OR BETWEEN PIECES OF EQUIPMENT IN A SYSTEM.

OM, SP. & WA O&M MANUALS/SPARE PARTS LIST/WARRANTIES

MAINTENANCE SUBMITALS SHALL INCLUDE BOTH MAINTENANCE AND OPERATING MANUALS. INCLUDE EMERGENCY INSTRUCTIONS, SPARE PARTS LISTINGS, WARRANTIES, WIRING DIAGRAMS, RECOMMENDED "TURN–AROUND" CYCLES, INSPECTION PROCEDURES, SHOP DRAWINGS, PRODUCT DATA, AND SIMILAR INFORMATION AS APPLICABLE.

RD. PROJECT RECORD DOCUMENTS

AS–BUILT DRAWINGS: A SET OF RED LINED PRINTS NOTING ALL DEVIATIONS FROM THE CONSTRUCTION DRAWINGS.

Figure 207-1

208 DRAWING SCALES AND TOLERANCES

1.0 GRAPHIC SCALES

A. When drawings are produced to scale, insert graphic scales illustrating the drawing scale. Use these formats for standard graphic scales: (Refer to Appendix B)

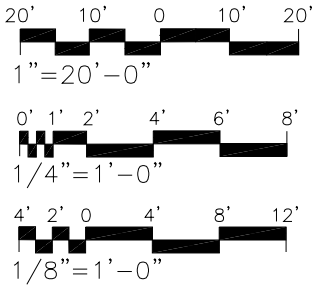


Figure 208-1

B. In the illustration above, 3/32" text (the minimum allowable) is shown for the distance designations for all graphic scales because of the limited space available. The drawing scale designation text is shown at 1/8". These text heights were selected for graphic clarity. Graphic scales are to be centered and 1/4" below the drawing title, see Figure 206-1 and 206-2 for examples.

C. Include the following statement as a General Note on the drawing sheet:

"If this sheet is not (state the original plot size, i.e., 24" x 36"), then it is a reduced size plot. Use graphic scale accordingly."

2.0 DRAWING SCALES

Acceptable drawing scales and the call out protocol for drawings are as follows:

Item	Scale	Item	Scale
Site Plans:	1" = 10'	Profiles:	1" = 20'
	1" = 20'	Horizontal Scale:	1" = 10'
	1" = 50'	Vertical Scale:	1" = 5'
	1" = 100'		
Utility Plans:	1" = 10'	Sections:	1/8" = 1'-0"
	1" = 20'		1/4" = 1'-0"
	1" = 50'		1/2" = 1'-0"
	1" = 100'		3/4" = 1'-0"
			1" = 1'-0"

(Continued on next page)

Item	Scale	Item	Scale
Floor Plans and Elevations:	1/16” = 1’-0” 1/8” = 1’-0” 1/4” = 1’-0”	Partial Plans:	1/4” = 1’-0” 1/2” = 1’-0”
Details:	1/2” = 1’-0” 3/4” = 1’-0” 1” = 1’-0” 1 1/2” = 1’-0” 3” = 1’-0”		

3.0 CONSISTENCY OF DRAWING SCALES

Draw all principal plans in a drawing set at the same scale.

4.0 EQUIPMENT ROOM DRAWING SCALES

A. Layout all equipment, piping, conduits, trays, ducts, wiring, etc., located within the equipment rooms on an enlarged partial floor plan shown at 1/4" = 1' - 0" scale minimum.

B. In rooms, areas, and spaces that are designed to accommodate equipment, show the equipment layout in detail plans, interior elevations and sections, as required for clarity.

C. Use enlarged sections and details to show congested areas at minimum scale of 1/2" = 1' - 0" for clarity.

5.0 NO SCALE DRAWINGS

Certain details, diagrams, and plans cannot or need not be drawn to a specific scale (i.e., wiring, P&IDs, schematics, and control diagrams). For the drawing scale notation type "SCALE: NONE" indicating that no scale was used in generating the drawing.

Figure 208-2

6.0 TOLERANCES

Guidance: Tolerances should be noted per ANSI Y14.5 - 1994, “Dimensioning and Tolerancing for Engineering Drawings (inches),” and client design criteria.

209 DIMENSIONING

1.0 GENERAL

A. Specify dimensions of less than one foot in inches, for example:

11 1/2"

B. Specify dimensions one foot and over in feet and inches, for example:

2' - 6 1/4"

C. Exception to these rules occurs when dimensioning civil drawings, mechanical ductwork and piping, electrical control cabinets and boxes, or architectural woodwork.

2.0 DIMENSION LINE CONVENTION AND TEXT ORIENTATION

A. Use unbroken dimension lines with the dimension text located above the line. All dimension text must be read from the bottom or right side of the drawing sheet.

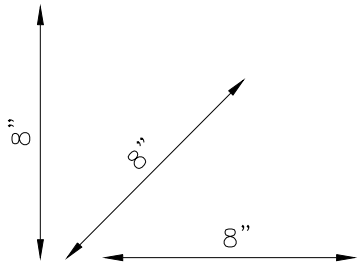


Figure 209-1

B. *Guidance: For examples of text orientation for isometric drawings refer to Global Engineering Documents, current edition, Section 3 and 4; DOE Handbook 1016, or AIA Architectural Graphic Standards.*

3.0 DIMENSION LINE TERMINATION

A. Arrowheads, slashes, and dots are all acceptable terminators for dimension lines.

B. Draw a heavy terminator (arrowhead 1/8" in length, 45 degree diagonal, 0.80 mm line width tic mark, or 1/16" diameter solid circle) to ensure readability when reproduced or reduced to half size. Use a consistent terminator throughout all drawing sheets for a discipline in a drawing set. AutoCAD setting for terminator to be 1/8 inch.

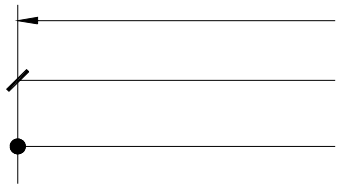


Figure 209-2

4.0 PLAN DIMENSIONS

A. *Keep dimension lines clear of the building footprint whenever possible.*

B. *Place dimension lines in a logical progression (i.e., centerlines, projections, overall, etc.).*

C. *Keep the dimensions consistent on all plans.*

D. *Tie all building portions together clearly.*

E. *Do not dimension to hidden features.*

F. *Refer to the National CAD Standards Manual Drafting Conventions, current edition, for hierarchy of dimensioning.*

5.0 DIMENSIONS NOT TO SCALE

When dimensional changes are made on drawings that affect the dimensions shown on a detail, it is not necessary to change the detail to agree with the new dimension. Change the dimension text to match the new dimension and note "NTS" below the dimension line, to indicate "Not to Scale" as illustrated below.

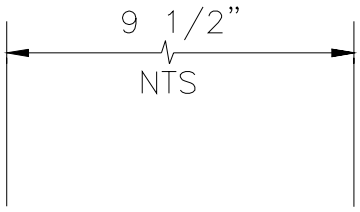


Figure 209-3